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EVALUATION OF OBESITY DEGREE FROM THE POINTS OF VIEW OF CHRONOLOGICAL AS WELL AS METABOLIC AGES

Obezite Derecesinin Kronolojik ve Metabolik Yaş Açılarından Değerlendirilmesi

Mustafa Metin DONMA[1], Orkide DONMA[2]

[1]Tekirdağ Namık Kemal Üniversitesi, Tıp Fakültesi, Tekirdağ, Türkiye.
[2]İstanbul Üniversitesi-Cerrahpaşa, Cerrahpaşa Tıp Fakültesi, İstanbul, Türkiye.

Abstract

Aim: Obesity degree is the ratio of current weight to standart weight of the individual. Metabolic age (MA) compares the individual's basal metabolic rate to an average for the individual's age group. In this study, considering the close association of obesity with chronic diseases, the aim is to evaluate the association between obesity degree and chronological age (CA) as well as MA and to derive a more descriptive index related to age.

Materials and Methods: In this study, 287 adults between 18 and 79 years of age [10 underweight, 86 individuals with normal body mass index (BMI), 90 overweight, 81 obese ve 20 morbid obese] were evaluated. Anthropometric measurements were performed. The values for BMI were calculated. Obesity degree, MA, visceral adiposity values were recorded using TANITA body composition monitor. Differences between CA and MA were calculated. Statistical analyses were performed.

Results: The mean±SD values for CA and MA for the study population were calculated as 43.2±16.0 and 46.3±16.3 years, respectively. This value for visceral adiposity was 8.2±4.8. A weak correlation was observed between obesity degree and CA. No correlation was observed between obesity degree and MA. However, a strong negative correlation was found between CA-MA and obesity degree. There was also a strong correlation between this index and visceral adiposity.

Conclusions: It is concluded that during the evaluation of obesity degree, this new index, considering the difference between CA and MA, would give much more useful information rather than CA or MA.

Key words: Chronological age, metabolic age, obesity degree, visceral adiposity.

Öz

Amaç: Obezite derecesi, bireyin mevcut ağırlığının ideal ağırlığına olan oranıdır. Metabolik yaş (MY), bireyin bazal metabolik hız (BMH)'ının, bireyin kronolojik yaş grubunun ortalama BMH'ı ile kıyaslanmasını sağlayan bir parametredir. Bu çalışmada, obezitenin kronik hastalıklarla olan yakın ilişkisi gözönüne alınarak, obezite derecesi ile kronolojik yaş (KY) ve MY arasındaki ilişkinin değerlendirilmesi ve yaşla ilgili daha belirleyici bir indeksin türetilmesi amaçlanmıştır. Klinisyenlerin antenatal fetal hareketlerde azalma gördükleri gebelerde, fetal kayıp olabileceği için tedirgin olup olmamaları gerektiğine, perinatal sonuçlar değerlendirilerek farkındalık yaratmak amaçlanmıştır.

Materyal ve Metot: Çalışmada 18 ile 79 yaş arasında 287 yetişkin birey [10 düşük kilolu, 86 normal vücut kitle indeksi (VKİ)'ne sahip, 90 fazla kilolu, 81 obez ve 20 morbid obez] değerlendirildi. Antropometrik ölçümler kaydedildi. VKİ değerleri hesaplandı. Obezite derecesi, MY, viseral adipozite değerleri TANITA body composition monitor kullanılarak kaydedildi. KY-MY hesaplandı. İstatistiksel analizler gerçekleştirildi.

Bulgular: Çalışma populasyonunun KY ve MY ortalama±SS değerleri sırasıyla 43.2±16.0 yıl ve 46.3±16.3 yıl olarak hesaplandı. Viseral adiposite için bu değer 8.2±4.8 idi. Obezite derecesi ile KY arasında zayıf bir korelasyon gözlendi. Obezite derecesi ile MY arasında herhangi bir ilişki saptanamadı. Obezite derecesi ile KY-MY arasında güçlü bir negatif ilişki bulundu. Bu indeks ile viseral adipozite arasında da güçlü bir ilişki hesaplandı.

Sonuç: Obezite derecesinin değerlendirilmesinde KY ya da MY'ın değil, aralarındaki farkı göz önüne alan bu yeni indeksin çok daha yararlı bilgiler vereceği saptandı.

Anahtar kelimeler: Kronolojik yaş, metabolik yaş, obezite derecesi, viseral adipozite.

INTRODUCTION

Obesity is a severe health problem. Its prevalence along with its comorbidities, which are generally life-threatening, are rising throughout the world. Therefore many scientists are in an attempt to find out new agents as well as indexes for the evaluation and management of obesity [1].

Corresponding Author / Sorumlu Yazar:

Mustafa Metin DONMA
Adres: Tekirdağ Namık Kemal Üniversitesi, Tıp Fakültesi, İstanbul, Türkiye.
E-posta: mdonma@nku.edu.tr

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One of the problems is the tool used to measure obesity. Measuring the epicardial fat and other visceral fat appears as the best ways to evaluate fat, however, they require sophisticated and expensive medical equipments, which can be used by specialists. They are also impractical to be used by the general population. Therefore, impedance is suggested particularly in epidemiological studies and during the examination of the individuals [2,3]. A recent study has successfully used this method for the assessment of body composition among patients treated with L-dopa for Parkinson' disease [4].

Body mass index (BMI) is the most widely used parameter for the evaluation and interpretation of obesity. Understanding the advantages and the limitations of BMI is a major topics of concern. So far, BMI has been considered as an indicator of body fatness and widely used as a screening method of obesity. Considering alterations in body composition is important. There are also studies reporting that it is time to move beyond the BMI as a surrogate for determining body fat mass [3,5,6].

Obesity degree is the percentage above or below ideal weight of the individual. A higher amount of body fat is related to a proinflammatory state [3].

Metabolic age (MA) is a parameter, which compares the individual's basal metabolic rate (BMR) to an average for the individual's age group. Higher MA compared to the chronological age is indicates the need for the improvement of the metabolic rate.

Visceral fat is the increased amount of fat stored around the abdominal organs in the body. Individuals with abdominal obesity appear to have excessive amount of visceral fat. Visceral adiposity is known to be linked with cardiovascular diseases, hypertension and diabetes in the future years of life.

In this study, considering the close association of obesity with chronic diseases, the aim is to evaluate the association between obesity degree and chronological age as well as metabolic age and to derive a more descriptive index related to age.

MATERIAL AND METHODS

In this study, 287 adults between 18 and 79 years of age [10 underweight (UW; Group 1), 86 individuals with normal body mass index (BMI) values (N-BMI; Group 2), 90 overweight (OW; Group 3), 81 obese (OB; Group 4 [n= 53] and Group 5 [n=28]) ve 20 morbid obese (MO; Group 6)] were evaluated. Chronological as well as metabolic ages were recorded. Anthropometric measurements were performed. The values for BMI were calculated. Differences between chronological age (CA) and MA [CA-MA] were computed.

Selection and description of patients

European weight classification based on the BMI method (WHO standards as the standard ranges for BMI) was used[7]. Groups were defined as underweight (UW; below 18.5 kg/m^2, Group 1), normal (NW; optimal, moderate; 18.5-24.9 kg/m^2, Group 2), overweight, (OW; dangerous weight level; 25.0-29.9 kg/m^2, Group 3), 1st level obesity (FLO; dangerous; 30.0-34.9 kg/m^2, Group 4), 2nd level obesity (SLO; advanced; 35.0-39.9 kg/m^2, Group 5), 3rd level obesity (TLO; very advanced; above 40 kg/m^2 Group 6).

The study protocol and procedures were approved by Namik Kemal University Ethics Committee. The participants gave written informed consent.

Technical information

Obesity degree, body fat mass, body fat percentage, metabolic age, visceral adiposity values were registered with body composition monitor. based upon bioelectrical impedance analysis technology (Tanita SC-330 Body Composition Analyzer, Tanita Corp., Tokyo, Japan).

Statistical evaluation

Statistical analyses were performed using SPSS. Descriptive statistics were performed. Data were presented as mean ± standard deviation (SD). Means of the groups were compared. One-way analysis of variance (ANOVA) and post hoc Tukey tests were used. Pearson's and Spearman's rho correlation analyses were performed based upon the nature type of the data distribution. Scatterplots were drawn with a linear regression line. Differences were considered statistically significant at a p level of ≤0.05.

RESULTS

The mean±SD values for CA, MA and the difference between these two parameters for the study population were calculated as 43.2±16.0 years, 46.3±16.3 years, and -3.1±5.9, respectively. We observed an overall mean BMI of 28.7±6.9 kg/m^2. The values for obesity degree, fat mass, fat percentage, BMR and visceral adiposity were 22.1±30.2, 25.1±13.2 kg., 30.5±10.7, 1626±339 kcal, and 8.2±4.8, respectively.

The mean±SD values for these obesity-related parameters of the groups were tabulated in Table 1.

Table 1. The values for obesity-related parameters calculated in underweight, normal weight, overweight, obese, and morbid obese groups.

Groups/ Parameters	Group 1 (mean±SD)	Group 2 (mean±SD)	Group 3 (mean±SD)	Group 4 (mean±SD)	Group 5 (mean±SD)	Group 6 (mean±SD)
CA (years)	35.1±20.5	41.1±17.1	44.5±15.7	44.1±14.5	45.6±16.4	44.4±12.9
MA (years)	36.0±23.0	38.9±16.5	46.3±13.8	51.2±13.1	56.5±15.8	56.4±12.9
VA	2.7±2.9	4.8±3.3	7.8±3.3	10.4±3.1	12.7±3.7	14.5±6.9
BMR (kcal)	1245±88	1440±210	1619±269	1741±345	1853±351	2028±412
Fat mass (kg)	6.3±3.2	14.2±4.9	22.7±5.7	31.0±5.7	39.9±6.1	55.5±9.9
Fat percent (%)	12.9±6.2	23.4±8.8	29.8±7.8	35.4±6.6	40.1±6.2	46.4±5.4
BMI	16.7±1.6	22.5±1.7	27.5±1.4	32.2±1.3	37.1±1.6	45.0±3.9
Obesity degree	-23.4±15.2	-1.6±14.0	16.2±12.3	36.4±14.1	54.4±13.0	89.9±22.7
CA-MA	-0.9±3.1	2.2±3.6	-1.8±4.2	-7.1±3.0	-10.9±1.6	-12.0±0.2

CA-chronological age, MA-metabolic age, VA-visceral adiposity, BMR-basal metabolic rate

There was no statistically significant differences between the chronological ages of the groups (p= 0.355). BMI values of the groups differed significantly from one another (p=0.001). The same was observed also for obesity degree, fat mass and fat percentage.

Visceral adiposity differed significantly between NW-OW and OW-FLO groups. This parameter was not a discriminative one between UW-NW, FLO-SLO and SLO-TLO. In terms of BMR values, NW and OW were the only groups exhibiting a significant difference between groups. The pattern for MA was the same as that of CA (p>0.05). However, groups significantly differed except UW-NW and SLO-TLO upon consideration of CA-MA.

A weak correlation was observed between obesity degree and CA. None was found between BMI and CA. No correlation was observed between obesity degree and MA (r=0.038; p=0.517). However, when the correlation between CA-MA and obesity degree

was examined, a strong negative correlation was found between this index and obesity degree (r= - 0.828; p=0.001) (Figure 1).

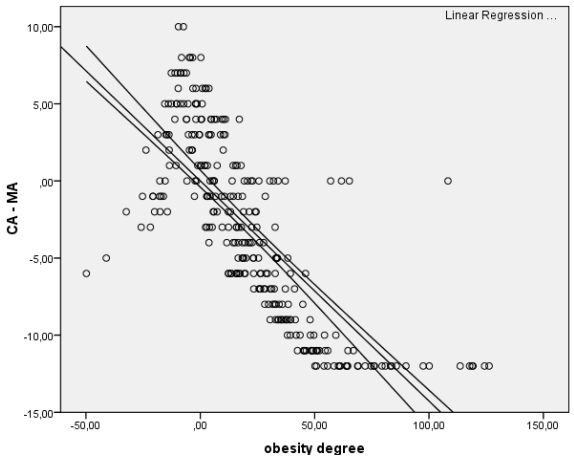

Figure 1. Scatterplots of individual measurements for CA-MA index versus obesity degree in study population. A negative correlation is observed. A linear regression line is displayed.

This correlation was confirmed also by the correlation between BMI and CA-MA (r= - 0.774; p=0.001). There was a strong correlation between this index and visceral adiposity (r= -0.400; p=0.001). Visceral adiposity was also correlated with obesity degree (r= 0.406; p=0.001).

Discussion and Conclusion

Age has been a parameter, which is of a great concern, within the scope of scientific literature. There are studies evaluating the effect of chronological, biological and/or metabolic ages on different parameters in clinical medicine [8-12].

Chronological age is the most commonly investigated age type. Indicators of body adiposity were recommended to be evaluated by chronological age [11]. A progressive increase was reported in height, weight and bone mineral density with the advance of chronological age [12]. On the other hand, in another report, it is stated that currently used growth references for CA may lead to misclassification of overweight [8].

In a study performed on centenarians, with a median age of 100 years, the overall mean MA obtained was 83.52±1.11 years, well below CA. They were mostly UW rather than being OW, a reducing factor in life expectancy. Thinness is possibly a natural process contributing to the longevity [10]. In our study, MA was higher than CA in all groups except NW group,

Obesity degree (%) serves as an index for the evaluation of the individual's obesity and is the ratio of current weight-to- ideal weight multiplied by 100. It is reported that it is not of much help in evaluating the real state of the obesity and only allows one to know if he/she is overweight. Excess visceral adipose tissue, located around abdominal organs, is a major risk factor for metabolic diseases[13]. In our study, there was a strong positive correlation between obesity degree and visceral adiposity.

BMI is an index widely used in clinical medicine during the diagnosis of obesity. BMI has been an index the most commonly used within the scope of many investigations conducted on various obesity-related adult diseases[11]. In some reports, although it is stated that BMI is a rather poor indicator of body fat[6], our findings have pointed out that it agreed with the other commonly used parameters such as fat mass and fat percent.

It is concluded that during the evaluation of obesity degree, this new index, considering the difference between CA and MA, would give much more useful information rather than CA or MA.

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